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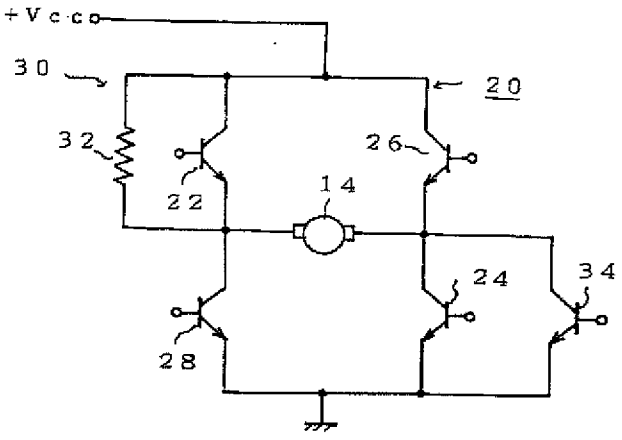
(54)【考案の名称】　エンジンのスロットルガバナ制御装置

(57)【要約】
【目的】　駆動用ＤＣモータをバング・バング制御する場合、リターンスプリングの付勢力に影響されることなくセカンダリバルブの開度設定を正確に行うことができるエンジンスロットルガバナ制御装置を提供すること。
【構成】　セカンダリバルブ駆動用のＤＣモータ１４に、４個のスイッチング素子２２，２４，２６，２８をブリッジ接続し、前記ＤＣモータ１４の低速駆動時に、前記スイッチング素子をバング・バング制御し前記セカンダリバルブを目標開度位置に向け移動させる。そして、スプリングバック防止回路３０を用い、前記バング・バング制御のオフタイミング時に、前記リターンスプリングの付勢力に抗し、セカンダリバルブを現在の開度位置に停止させるための保持用駆動電流を前記ＤＣモータ１４に通電する。



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【実用新案登録請求の範囲】

【請求項１】　アクセルペダルの踏み込み量に応じ吸気開度が設定されるスロットルバルブと、
前記スロットルバルブと並設され、上記スロットルバルブの開度により得られる吸気量を絞ってエンジンの過剰回転を抑制するセカンダリバルブと、
前記セカンダリバルブを、リターンスプリングによって付勢されている初期位置から開度調整するＤＣモータと、
を含むスロットルバルブガバナにおいて、
前記ＤＣモータに、前記リータンスプリグ付勢方向への順方向駆動用の少なくとも２個のスイッチング素子と、逆方向駆動用の少なくとも２個のスイッチング素子とをブリッジ接続し、前記ＤＣモータの低速駆動時に、前記スイッチング素子をバング・バング制御し前記セカンダリバルブを目標開度位置に向け移動させるモータ駆動回路と、
前記バング・バング制御のオフタイミング時に、前記リターンスプリングの付勢力に抗しセカンダリバルブを現在の開度位置に停止させるための保持用駆動電流を前記ＤＣモータに通電するスプリングバック防止回路と、
を含むことを特徴とするエンジンのスロットルガバナ制御装置。

【請求項２】　請求項１において、
前記スプリングバック防止回路は、
前記逆転駆動用のスイッチング素子のいずれかに並列接続され、通電電流を前記保持用駆動電流に限流する限流回路部と、
前記逆転駆動用の他のスイッチング素子に対し、前記バング・バング制御のオフタイミング時にバイパス用通電回路を形成するバイパス回路部と、
を含むことを特徴とするエンジンのスロットルガバナ制御装置。

【請求項３】　請求項２において、
前記限流回路部は、
前記逆転駆動用のスイッチング素子のいずれかに並列接続された抵抗素子として形成されたことを特徴とするエンジンのスロットルガバナ制御装置。

【請求項４】　請求項２において、
電源電圧の変動に伴う電流変動を補償する電流補償回路を含み、
前記限流回路部は、
前記逆転駆動用のスイッチング素子のいずれかに並列接続されたバイパス用スイッチング素子として形成され、
前記電流補償回路は、
電源電圧の変動を検出し、前記バング・バング制御のオフタイミング時に前記バイパス用スイッチング素子を一定の保持用駆動電流が流れるようＰＷＭ制御するよう形成され、
電源電圧の変動に影響されることなく、バング・バング制御のオフタイミング時に、前記リターンスプリングの勢力に抗しセカンダリバルブを現在の開度位置に停止させることを特徴とするエンジンのスロットルガバナ制御装置。

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【図面の簡単な説明】

【図１】本考案によるエンジンのスロットルガバナ制御装置の要部を説明するための回路図である。
【図２】図１に示した回路の動作説明図である。
【図３】図１に示した回路の他の動作説明図である。
【図４】図１に示した回路の別の動作説明図である。
【図５】図１に示した回路に用いられる各部材の動作を説明するための表図である。
【図６】図１に示した回路の特性を説明するためのタイミングチャートである。
【図７】図１に示した回路の他の特性を説明するためのタイミングチャートである。
【図８】図１に示した回路の変形例の回路図である。
【図９】図１に示した回路の別の変形例の回路図である。
【図１０】図１に示した回路のさらに別の変形例の回路図である。
【図１１】本考案によるエンジンのスロットルガバナ制御装置の第２実施例を示す回路図である。
【図１２】エンジンのスロットルガバナ装置の概略構成を示す模式図である。
【図１３】図１２に示した制御装置に用いられるモータの制御回路図である。
【図１４】図１に示した制御回路の特性を説明するための線図である。
【図１５】図１３に示した制御回路の問題点を説明するための線図である。

【符号の説明】

１０　スロットルバルブ
１２　セカンダリバルブ
１４　ＤＣモータ
２０　モータ駆動回路
２２　トランジスタ
２４　トランジスタ
２６　トランジスタ
２８　トランジスタ
３０　スプリングバック防止回路
３２　抵抗
３４　バイパストランジスタ
３６　オアゲート３６
１００　バッテリー電源
１０２　分圧抵抗
１０４　分圧抵抗
１０６　安定化電源
１０８　制御回路
１１０　トランジスタ

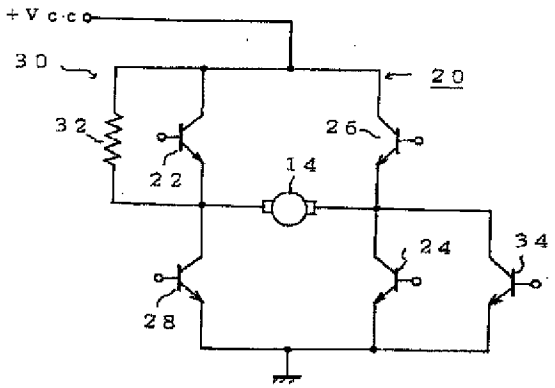
3

112　トランジスタ
114　FET

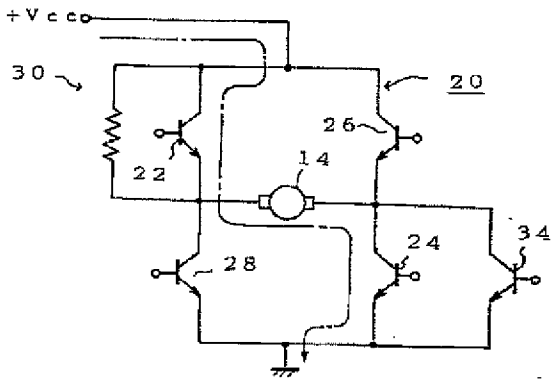
4

＊120　ICチップ
＊

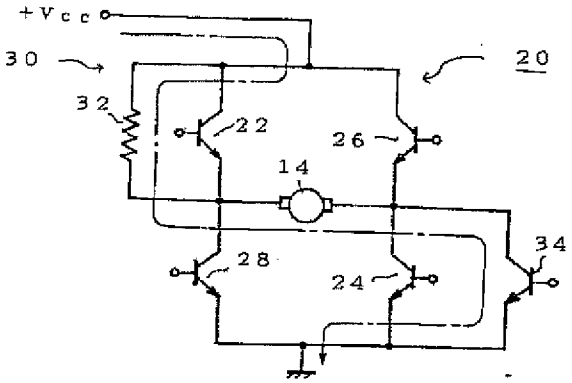
【図1】



【図2】



【図3】



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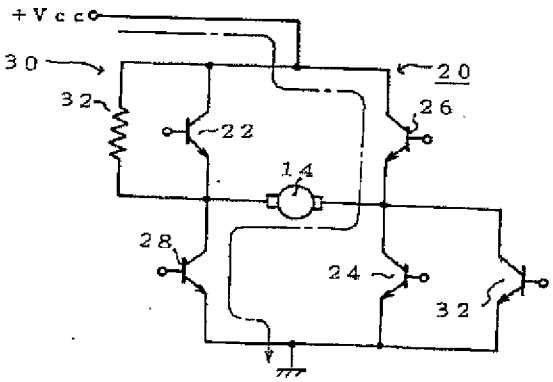
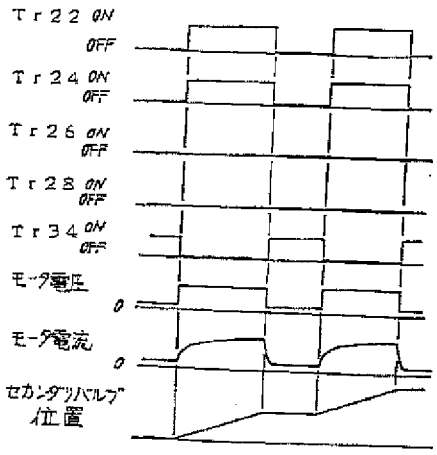


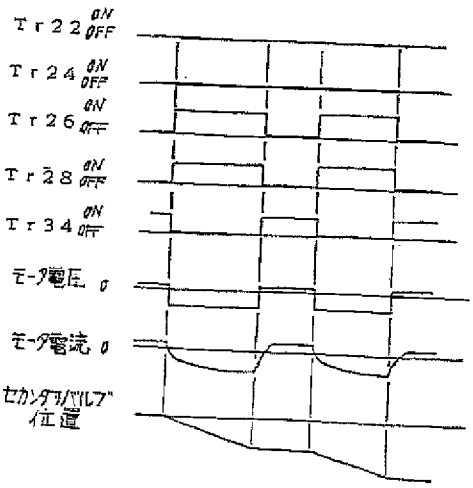
【図5】

	スプリング付勢方向と逆方向に回転するとき		スプリング付勢方向と同方向に回転するとき		バルブを停止させる時	制御しない時
	PWM信号 ON	PWM信号 OFF	PWM信号 ON	PWM信号 OFF		
Tr22	ON	OFF	OFF	OFF	OFF	OFF
Tr24	ON	OFF	OFF	OFF	OFF	OFF
Tr26	OFF	OFF	ON	OFF	OFF	OFF
Tr28	OFF	OFF	ON	OFF	OFF	OFF
Tr34	OFF	ON	OFF	ON	ON	OFF

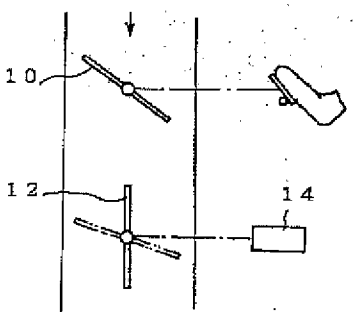
【図6】



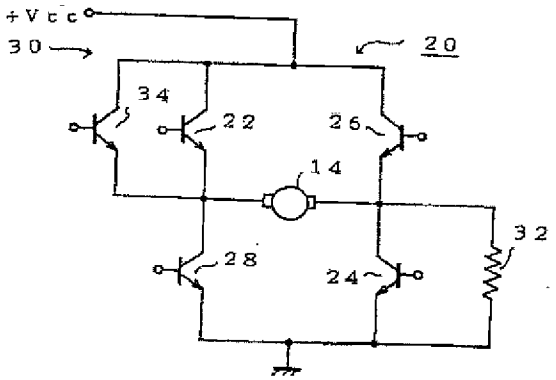
【図7】



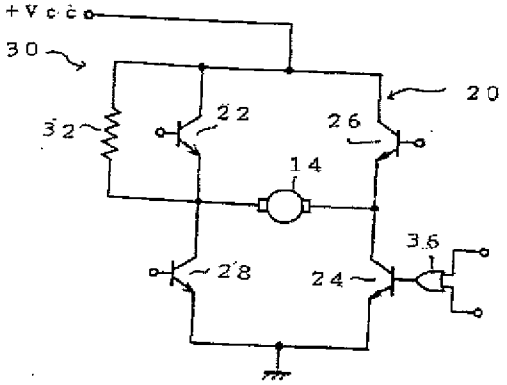
【図12】



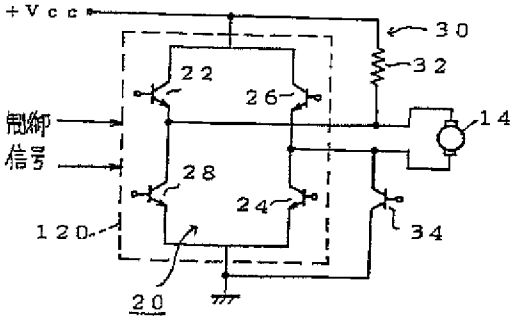
【図8】



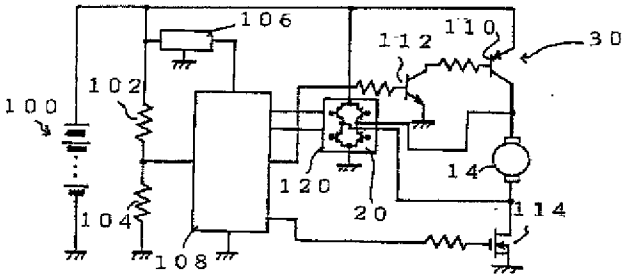
【図9】



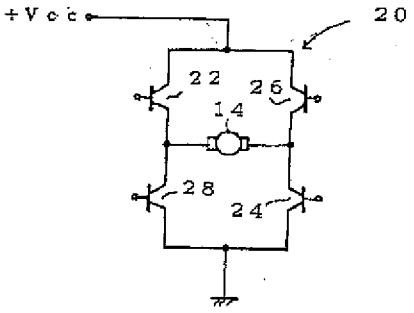
【図10】



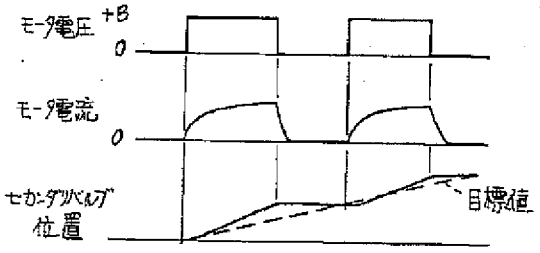
【図11】



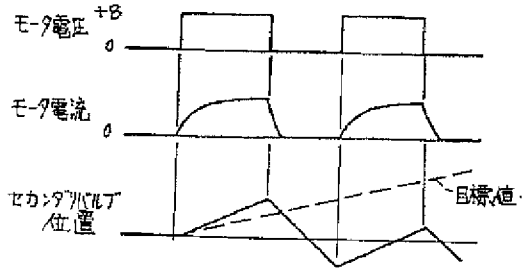
【図１３】


+Vcc
20
22
26
14
28
24

【図１４】


モータ電圧
+B
0
モータ電流
0
セカンダリバルブ
位置
目標値

【図１５】


モータ電圧
+B
0
モータ電流
0
セカンダリバルブ
位置
目標値

【考案の詳細な説明】

【０００１】

【産業上の利用分野】

本考案は、エンジンのスロットルガバナ制御装置に関し、さらに詳しくは、そのガバナ用セカンダリバルブの開度制御構造に関する。

【０００２】

【従来の技術】

所謂、エンジンの燃焼室に混合気を供給する吸気系には、アクセルペダルの踏み込み量に応じた吸気量を設定する場合に、その吸気量により生じる虞れのあるエンジンの過剰回転を防止する構造が採用されている。

【０００３】

このような吸気系に使用されるスロットルガバナとしては、アクセルペダルの踏み込み量に応じて吸気開度が設定されるスロットルバルブと、このスロットルバルブと並設されスロットルバルブ開度によって得られる吸気量を絞ってエンジンの過剰回転を抑制するセカンダリバルブとを備えたものが知られており、このようなスロットルガバナは、例えば荷役用の産業車両、芝刈機、およびその他各種のエンジン用スロットルガバナとして広く用いられている。

【０００４】

図１２には、このようなスロットルガバナの一般的な構成が示されている。このスロットルガバナは、エンジンの吸気路に、スロットルバルブ１０と、セカンダリバルブ１２とが並設されており、前記スロットルバルブ１０は、アクセルペダルの踏み込み量に応じてその開度が設定されるようになっている。

【０００５】

前記セカンダリバルブ１２は、ＤＣモータ１４を用いて回転駆動され、吸気路に対する開度が設定されるようになっている。例えば、スロットルバルブ１０の開度に応じて吸気量が多くなる場合には、セカンダリバルブ１２が吸気路を閉じる側に回転することによって吸気量を絞り、吸気量が増えた場合のエンジンの過剰回転を防止するスロットルガバナを構成している。

【０００６】

そして、このセカンダリバルブ１２は、通常、図示しないリターンスプリングによって吸気路を開放する位置あるいはこれとは逆に閉じる位置を初期位置として設定されており、ＤＣモータ１４の回転駆動によってその開度調整が行われるようになっている。

【０００７】

図１３には、前記ＤＣモータ１４の駆動に用いられる従来のモータ駆動回路の一例が示されている。

【０００８】

ここにおいて、リターンスプリングの付勢方向を順方向と定義すると、この従来のモータ駆動開路２０は、順方向駆動用の２個のスイッチング用トランジスタ２６，２８と、逆方向駆動用の２個のスイッチング用トランジスタ２２，２４とを、ＤＣモータ１４に対してブリッジ接続している。このようなブリッジ回路は通常Ｈブリッジと称されている。

【０００９】

そして、このブリッジ回路の一端側は、バッテリ電源Ｖccに接続され、他端側は、アース側に接続されており、順方向または逆方向に組み合わされたトランジスタを選択的にスイッチング制御することにより、ＤＣモータ１４を順方向、逆方向に回転駆動するようになっている。通常、前記ＤＣモータ１４の速度制御は、トランジスタをＰＷＭ制御することによって行われるが、このＰＷＭ制御では、モータ１４を低速駆動する場合に、十分なモータ起動電流を通電できず、モータを回転させることができないという問題があった。

【００１０】

すなわち、ＰＷＭ制御を用い、モータを低速回転させようとする場合、駆動電圧のデューティー比を小さくし、その印加時間を実質的に短くする必要があるが、このようにすると、モータを起動するために充分な電流を通電することができず、モータが回転しないか、あるいは、不安定またはヒステリシス現象を起こし、良好な低速回転を実現できなかった。

【００１１】

そこで、ＤＣモータ１４を低速で駆動する場合には、図１５に示すよう、ＰＷ

Ｍの周期を長く設定し、一回あたりの駆動電圧の印加時間を長くすることにより、ＤＣモータ１４を確実にかつ安定して駆動させるといういわゆるバング・バング制御が行われている。このバング・バング制御（ＢＡＮＧ－ＢＡＮＧ制御）は、図１５に示すようＰＷＭの周期ないし、駆動電圧の印加時間を長く設定することから、充分な駆動電流を通電し、モータを確実に駆動できる。しかし、この半面、電圧を印加しない時間も長くなるため、この間はモータ１４が停止してしまう。すなわち、モータ駆動電圧のオン・オフのタイミングに合わせて、ＤＣモータ１４が回転、停止を繰り返すステッピング駆動されることになる。

【００１２】

【考案が解決しようとする課題】

しかし、セカンダリバルブ１２には、前記したように常にリターンスプリングによる付勢力が作用しているため、ＤＣモータ１４がステッピング駆動されると、モータオフ時にリターンスプリングの付勢力によってセカンダリバルブ１２が引き戻されるというスプリングバックが生じる。このように、従来のモータ駆動回路では、ＤＣモータ１４をバング・バング制御すると、セカンダリバルブ１２の開度が駆動電圧のオフタイミング毎に引き戻されるというハンチング現象が発生してしまい、セカンダリバルブ１２の開度設定が極めて不安定となってしまい、実質的にＤＣモータ１４を低速駆動し、セカンダリバルブ１２の開度を微調整することはできないという問題があった。

【００１３】

このような不具合を解消する目的で、パルス幅変調におけるパルス周期を長くしてセカンダリバルブ１２の位置検出を行い、セカンダリバルブ１２の開度のフィードバック制御を行うことも考えられるが、このような方式によると、バルブの開度位置を検知するためのポテンションメータやエンコーダなどの特別な構成が必要になり、制御機構そのものが複雑かつ高価になってしまう。

【００１４】

本考案は、このような従来の課題に鑑みなされたものであり、その目的は、ＤＣモータをバング・バング制御する場合でも、リターンスプリングの付勢力に影響されることなくセカンダリバルブの開度設定を正確に行うことができるエンジ

ンスロットルガバナ制御装置を提供することにある。

【００１５】

【課題を解決するための手段】

前記目的を達成するため、本考案は、

アクセルペダルの踏み込み量に応じ吸気開度が設定されるスロットルバルブと、

前記スロットルバルブと並設され、上記スロットルバルブの開度により得られる吸気量を絞ってエンジンの過剰回転を抑制するセカンダリバルブと、

前記セカンダリバルブを、リターンスプリングによって付勢されている初期位置から開度調整するＤＣモータと、

を含むスロットルバルブガバナにおいて、

前記ＤＣモータに、前記リータンスプリグ付勢方向への順方向駆動用の少なくとも２個のスイッチング素子と、逆方向駆動用の少なくとも２個のスイッチング素子とをブリッジ接続し、前記ＤＣモータの低速駆動時に、前記スイッチング素子をバング・バング制御し前記セカンダリバルブを目標開度位置に向け移動させるモータ駆動回路と、

前記バング・バング制御のオフタイミング時に、前記リターンスプリングの付勢力に抗しセカンダリバルブを現在の開度位置に停止させるための保持用駆動電流を前記ＤＣモータに通電するスプリングバック防止回路と、

を含むことを特徴としている。

【００１６】

【作用】

本考案によれば、モータ駆動回路をバング・バング制御する場合に、スプリングバック防止回路を用い、バング・バング制御のオフタイミング時に、リターンスプリングの付勢力に抗しセカンダリバルブを現在の開度位置に停止させるための保持用駆動電流をＤＣモータに通電する。

【００１７】

これにより、バング・バング制御のオフ動作時に、ＤＣモータはリターンスプリングの付勢力を相殺するよう駆動され、リターンスプリングの付勢力によって

セカンダリバルブが引き戻されるというスプリングバック現象を確実に防止することができる。

【００１８】

従って、本考案によれば、ＤＣモータをバング・バング制御した場合でも、セカンダリバルブを目標開度位置に向け、従来のようにハンチング現象を発生させることなく確実に制御することができる。

【００１９】

【実施例】

次に本考案の好適な実施例を図面に基づき詳細に説明する。

【００２０】

第１実施例

図１には、本考案のスロットルガバナ制御装置の主要回路構成が示されている。なお、前述した図１２、図１３の従来装置と対応する部材には、同一符号を付し、その説明は省略する。

【００２１】

実施例のスロットルガバナ制御装置は、ＤＣモータ１４を駆動するモータ駆動回路２０と、モータ駆動回路２０のバング・バング制御時におけるスプリングバック現象を防止するスプリングバック防止回路３０とを含む。

【００２２】

前記モータ駆動回路２０は、図１３に示す従来の回路と同様に構成されている。例えば、ＤＣモータ１４を、リターンスプリングの付勢力と逆方向に回転駆動する場合には、図２に示すようトランジスタ２６，２８をオフ制御し、トランジスタ２２，２４をＰＷＭ制御して図中矢印方向へ駆動電流を通電する。

【００２３】

また、リターンスプリングの付勢力と同方向へ、モータ１４を順方向駆動する場合には、図４に示すようトランジスタ２２，２４をオフ制御し、トランジスタ２６，２８をＰＷＭ制御し、図中矢印方向へ駆動電流を通電する。

【００２４】

このようにして、モータ駆動回路２０は、ＤＣモータ１４にブリッジ接続され

た４個のスイッチング用トランジスタ２２，２４，２６，２８を選択的に制御することにより、ＤＣモータ１４を逆方向，順方向に回転駆動し、図１２に示すセカンダリバルブ１２の開度調整を行うことができる。

【００２５】

モータ駆動回路２０は、このようにトランジスタ２２，２４，２６，２８をＰＷＭ制御しセカンダリバルブ１２の開度調整を行うものであるが、モータ１４を低速で駆動しセカンダリバルブ１２の開度を微調整する場合には、ＰＷＭの周期を長くする、いわゆるバング・バング制御を行うことは前述した通りである。

【００２６】

前記スプリングバック防止回路３０は、前記バング・バング制御のオフタイミング時に、リターンスプリングの付勢力に抗しセカンダリバルブ１２をその停止位置に停止保持させるための保持用駆動電流をＤＣモータ１４に通電するよう形成されている。これにより、バング・バング制御のオフタイミング時に、リターンスプリングによりセカンダリバルブ１２が引き戻されるというスプリングバック現象が確実に防止され、ＤＣモータ１４を低速でステッピング駆動しながら、セカンダリバルブ１２を目標開度位置へ確実に移動させることができる。

【００２７】

実施例のスプリングバック防止回路３０は、逆転駆動用のトランジスタ２２に並列接続され通電電流を前記保持用駆動電流に限流する限流抵抗３２と、逆転駆動用の他のトランジスタ２４に並列接続され、バング・バング制御のオフタイミング時にバイパス用通電回路を形成するトランジスタ３４とを含む。なお、前記抵抗３２は、通電電流を前記保持用駆動電流に限流できるものならば、これ以外の素子および回路構成としてもよい。

【００２８】

従って、駆動回路２０のバング・バング制御のオフタイミング時に、図３に示すよう、トランジスタ３４をオンすることにより、ＤＣモータ１４には逆方向駆動用の電流が通電されることになる。このときＤＣモータ１４の回転出力は、リターンスプリングの付勢力を相殺する程度の値となるよう、この駆動電流が抵抗３２によって制御される。従って、バング・バング制御のオフタイミング時に、

リターンスプリングの付勢力によってセカンダリバルブ１２が引き戻されるというスプリングバック現象が確実に防止されることになる。

【００２９】

図５には、モータ駆動回路２０をバング・バング制御する際、前記各トランジスタ２２～２８、３４をどの様にオン・オフ制御するかが示されている。

【００３０】

図６，図７には、図５に示す手順に従って、実施例の制御回路を駆動する際のタイミングチャートが示され、図６は、ＤＣモータ１４をモータ付勢力と反対方向（逆方向）に駆動する場合のタイミングチャート、図７はＤＣモータ１４をダウンスプリングの付勢力と同方向（順方向）に駆動する場合のタイミングチャートがそれぞれ示されている。

【００３１】

同図に示すよう、モータ駆動回路２０をバング・バング制御する際に、そのオフタイミングに合わせてスプリングバック防止回路３０のバイパス用トランジスタ３４をオン制御し、ＤＣモータ１４にリターンスプリングの付勢力を相殺する保持力を与える。これにより、セカンダリバルブ１２を目標開度位置に向け確実に移動制御することができる。

【００３２】

図１４には、セカンダリバルブ１２の目標開度位置が破線で表され、また、実施例の回路を用いて制御される実際の開度位置が実線で表されている。同図に示すよう、リターンスプリングの付勢力を相殺しながら、モータ駆動回路２０をバング・バング制御する実施例の装置では、目標開度位置に沿ってセカンダリバルブ１２を確実に制御できることが理解されよう。

【００３３】

ところで、上述したスプリングバック防止回路３０の構成としては、抵抗３２とトランジスタ３４との位置を逆にしても良く、この場合の構成は図８に示してある。

【００３４】

また、図９に示すよう、逆転駆動用のトランジスタ２４のベースにオア(OR)ゲ

ート３６を接続し、このオアゲート３６の一方の入力端子に、ＤＣモータ駆動回路２０としての制御信号を入力し、またオアゲート３６の他方の端子にスプリングバック防止回路３０としての制御信号を選択的に入力するように形成してもよい。これにより、モータ駆動回路２０の一部のトランジスタ２４を、スプリングバック防止回路３０の回路の一部としても兼用して、回路全体のコストダウンを図ることができる。

【００３５】

また、上述したスプリングバック防止回路３０は、ＤＣモータ１４の駆動回路２０に後付けすることも可能である。図１０はこの場合の構成を示しており、同図においては、ブリッジ状に配列されたトランジスタ２２～２８がＩＣチップ１２０として形成され、このＩＣチップ１２０の端子部に対して、図１に示した回路と等価的に、ＤＣモータ１４、スプリングバック防止回路３０が接続されている。

【００３６】

第２実施例

次に本発明の好適な第２実施例を説明する。

【００３７】

上述したＤＣモータ１４への電源としては、エンジンに付設されているバッテリーを用いることが多い。このバッテリー電源を用いる場合には、他の電装部品での消費電力が多くなったりすると、電源電圧が低下し、バングーバング制御のオフタイミング時におけるセカンダリバルブ１２の位置保持が不安定となる虞れがある。

【００３８】

つまり、ＤＣモータ１４をリターンスプリングの付勢方向と逆方向に駆動するための電流が、バッテリー電源の電圧変動によって低下してしまうと、ＤＣモータ１４の回転トルクが所定値に至らず、結果として、セカンダリバルブ１２が、リターンスプリングの付勢力によって、所定の位置から外れた位置に引き戻されてしまうおそれがある。

【００３９】

図１１には、このような課題を解決した本発明の好適な実施例が示され、本実施例の特徴は、バッテリー電源１００の電圧を検出し、この検出結果に基づき、バング・バング制御のオフタイミング時にＤＣモータ１４に流れる電流が常に一定の値となるように制御したことにある。

【００４０】

実施例において、モータ駆動回路２０は、図１０に示す具体例と同様にＩＣチップ１２０として形成されている。なお、その詳細は図１０に示す回路構成と同様なので、ここではその説明は省略する。

【００４１】

また、実施例のスプリングバック防止回路３０は、逆転駆動用のトランジスタ２２と並列接続されたバイパス用トランジスタ１１０と、このバイパストランジスタ１１０駆動用のトランジスタ１１２と、他の逆転駆動用トランジスタ２４と並列接続された限流用のＦＥＴ１１４とを含む。

【００４２】

実施例の回路には、バッテリー電源１００の電圧を分圧出力する分圧用抵抗１０２，１０４と、この分圧出力が入力される制御回路１０８と、前記制御回路１０８用の安定化電源１０６とを含む。

【００４３】

前記制御回路１０８は、安定化電源２４によって定電圧駆動されるマイクロコンピューターを含み、図示しないＩ／Ｏインタフェースフェイス内のＡ／Ｄ変換器を介して前記分圧回路の出力が入力され、バッテリー電源１００の電圧変動を検出している。またこの制御回路１０８は、図示しないＩ／Ｏインタフェース内のＤ／Ａ変換器を介して、モータ駆動回路２０を構成するＩＣチップ１２０，トランジスタ１１２、ＦＥＴ１１４を制御するよう構成されている。

【００４４】

すなわち、制御回路１０８は、モータ駆動回路２０をＰＷＭ制御しＤＣモータ１４を駆動制御すると共に、ＤＣモータ１４を低速駆動する場合には、駆動回路２４を前記したようにバング・バング制御している。

【００４５】

さらに、モータ１４をバング・バング制御する場合には、バング・バング制御のオフタイミングに合わせてトランジスタ１１２を介してバイパス用トランジスタ１１０をオン駆動し、さらにバッテリー電源１００の電圧変動に応じＤＣモータ１４に所定の保持用駆動電流が流れるようＦＥＴ１１４をＰＷＭ制御する。

【００４６】

すなわち、制御回路１０８内には、分圧抵抗１０２，１０４を介して入力される分圧電圧と、この分圧電圧出力時にリターンスプリングと釣り合うＰＷＭ制御用のデューティー比との関係がルックアップテーブルとして予め記憶されており、制御回路１０８は、入力される分圧電圧に対応したデューティー比でＦＥＴ１１４をＰＷＭ制御する。

【００４７】

これにより、バング・バング制御のオフタイミング時にＤＣモータ１４は電源電圧の変動に変わりなく、リターンスプリングの付勢力とバランスする回転出力を発生し、セカンダリバルブ１２のスプリングバック現象をより確実に防止することができる。

【００４８】

なお、本考案は前記各実施例に限定されることなく、本考案の要旨の範囲内で各種の変形実施が可能である。

【００４９】

【考案の効果】

以上説明したように本考案によれば、モータ駆動回路をバング・バング制御し、ＤＣモータを低速駆動しながらセカンダリバルブを所定開度位置に制御する場合に、バング・バング制御のオフタイミング時に、リターンスプリングの付勢力に抗しセカンダリバルブを現在の開度位置に停止させるための保持用駆動電流をＤＣモータに通電することにより、セカンダリバルブのスプリングバックを確実に防止し、セカンダリバルブを所定開度位置に正確に移動し位置決めすることができる。

【００５０】

特に、本考案によれば、バング・バング制御を用いたセカンダリバルブの開度

調整を、複雑な制御回路を用いることなく、簡単かつ安価に行うことができるという効果がある。

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TECHNICAL FIELD

[Industrial Application]
This design is related with the opening control structure of the secondary valve for centrifugal spark advancers in more detail about an engine throttle centrifugal-spark-advancer control device.
[0002]

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PRIOR ART

[Description of the Prior Art]
When setting up the inspired air volume according to the amount of treading in of the accelerator pedal, the structure of preventing superfluous rotation of an engine with a possibility of producing with the inspired air volume is adopted as the suction system which supplies gaseous mixture to the so-called combustion chamber of an engine.
[0003]
As a throttle centrifugal spark advancer used for such a suction system, The throttle valve to which an inhalation-of-air opening is set according to the amount of treading in of an accelerator pedal, The thing provided with the secondary valve which extracts the inspired air volume which is installed side by side with this throttle valve, and is obtained by the throttle valve, and controls superfluous rotation of an engine is known, Such a throttle centrifugal spark advancer is widely used, for example as the industrial truck for cargo work, a lawn mower, and a throttle centrifugal spark advancer for engines of other various kinds.
[0004]
Such a throttle centrifugal spark advancer's general composition is shown in drawing 12. For this throttle centrifugal spark advancer, the throttle valve 10 and the secondary valve 12 are installed in the engine intake path side by side.
As for said throttle valve 10, the opening is set up according to the amount of treading in of an accelerator pedal.

[0005]
Said secondary valve 12 is rotated using DC motor 14, and the opening to an intake path is set up. For example, when inspired air volume increases according to the opening of the throttle valve 10, and the secondary valve 12 rotates to the side which closes an intake path, inspired air volume is extracted and the throttle centrifugal spark advancer which prevents superfluous rotation of an engine when inspired air volume increases is constituted.
[0006]
And this secondary valve 12 is set up considering the position closed contrary to the position or this which usually opens an intake path with the return spring which is not illustrated as an initial position.
The opening adjustment is performed by rotation of DC motor 14.

[0007]
An example of the conventional motor drive circuit used for the drive of said DC motor 14 is shown in drawing 13.
[0008]
When the energizing direction of a return spring is defined as a forward direction, in here this conventional motor drive open circuit 20, Bridge connection of the two transistors 26 and 28 for switching for a forward direction drive and the two transistors 22 and 24 for switching for an opposite direction drive is carried out to DC motor 14. Such a bridged circuit is usually called H bridge.
[0009]
And the one end side of this bridged circuit is connected to the battery power source Vcc, and the other

end side is connected to the ground side.
By carrying out switching control of the transistor combined with the forward direction or the opposite direction selectively, DC motor 14 is rotated to a forward direction and an opposite direction.
Usually, by this PWM control, although speed control of said DC motor 14 was performed by carrying out PWM control of the transistor, when low speed driving of the motor 14 was carried out, sufficient motor starting current could not be energized but there was a problem that a motor could not be rotated.
[0010]
Namely, when the low speed rotary of the motor tends to be carried out using PWM control, it is necessary to make duty ratio of driver voltage small and to shorten the applying time substantially, and, When done in this way, in order to start a motor, sufficient current could not be energized, but a motor did not rotate, or instability or a hysteresis phenomenon was caused, and a good low speed rotary was not able to be realized.
[0011]
So, when driving DC motor 14 at a low speed, as shown in drawing 15, what is called bang-bang control of being stabilized and making DC motor 14 drive certainly is performed by setting up the cycle of PWM for a long time, and lengthening applying time of the driver voltage per time. This bang-bang control (BANG-BANG control) energizes sufficient driving current from setting up the cycle of PWM thru/or the applying time of driver voltage for a long time, as shown in drawing 15, and it can drive a motor certainly. However, since time not to impress this one side and voltage also becomes long, the motor 14 will stop in the meantime. that is, according to the timing of turning on and off of motor driving voltage, DC motor 14 repeats rotation and a stop -- a stepping drive will be carried out.
[0012]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Device]
However, since the energizing force by a return spring is always acting on the secondary valve 12 as described above, If the stepping drive of DC motor 14 is carried out, the springback that the secondary valve 12 is pulled back by the energizing force of a return spring at the time of motor-off will arise. Thus, in the conventional motor drive circuit, if bang-bang control of DC motor 14 is carried out, The hunting phenomena that the opening of the secondary valve 12 is pulled back for every OFF timing of driver voltage occur, Opening setting out of the secondary valve 12 became very unstable, low speed driving of DC motor 14 was carried out substantially, and there was a problem that the opening of the secondary valve 12 could not be tuned finely.
[0013]
Although lengthening the pulse cycle in Pulse Density Modulation, performing the detecting position of the secondary valve 12, and performing feedback control of the opening of the secondary valve 12 for the purpose of canceling such fault is also considered, According to such a method, special composition, such as potentionmeter for detecting the opening position of a valve and an encoder, will be needed, and the control mechanism itself will become intricately and expensive.
[0014]
This design is made in view of such conventional SUBJECT, and the purpose, Even when carrying out bang-bang control of the DC motor, it is in providing the engine throttle centrifugal-spark-advancer control device which can perform opening setting out of a secondary valve correctly without being influenced by the energizing force of a return spring.
[0015]

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MEANS

[Means for Solving the Problem]
A throttle valve to which an inhalation-of-air opening is set according to this design and the amount of treading in of an accelerator pedal in order to attain said purpose, A secondary valve which is installed side by side with said throttle valve, extracts inspired air volume obtained with an opening of the above-mentioned throttle valve, and controls superfluous rotation of an engine, In a throttle-valve centrifugal spark advancer containing a DC motor which carries out opening adjustment of said secondary valve from an initial position energized with a return spring, To said DC motor, at least two switching elements for a forward direction drive to said Litang SUPURIGU energizing direction, Bridge connection of at least two switching elements for an opposite direction drive is carried out, A motor drive circuit which carries out bang-bang control of said switching element, and turns said secondary valve to a target opening position at the time of low speed driving of said DC motor and to which it is made to move, At the time of OFF timing of said bang-bang control, it is characterized by including a springback prevention circuit which energizes driving current for maintenance for resisting energizing force of said return spring and making the present opening position stop a secondary valve to said DC motor.
[0016]

[Translation done.]

* NOTICES *

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OPERATION

[Function]
When carrying out bang-bang control of the motor drive circuit according to this design, The driving current for maintenance for resisting the energizing force of a return spring and making the present opening position stop a secondary valve is energized to a DC motor using a springback prevention circuit at the time of the OFF timing of bang-bang control.
[0017]
Thereby, at the time of the OFF operation of bang-bang control, a DC motor is driven so that the energizing force of a return spring may be offset, and it can prevent certainly the spring back phenomenon that a secondary valve is pulled back by the energizing force of a return spring.
[0018]
Therefore, according to this design, even when bang-bang control of the DC motor is carried out, a secondary valve is turned to a target opening position, and it can control certainly, without generating hunting phenomena like before.
[0019]

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EXAMPLE

[Example]
Next, suitable working example of this design is described in detail based on Drawings.
[0020]
The major circuit composition of the throttle centrifugal-spark-advancer control device of this design is shown in 1st working example drawing 1. Identical codes are given to drawing 12 and the conventional device of drawing 13 which were mentioned above, and a corresponding member, and the explanation is omitted to them.
[0021]
The throttle centrifugal-spark-advancer control device of working example includes the motor drive circuit 20 which drives DC motor 14, and the springback prevention circuit 30 which prevents the spring back phenomenon at the time of the bang-bang control of the motor drive circuit 20.
[0022]
Said motor drive circuit 20 is constituted like the conventional circuit shown in drawing 13. For example, in rotating DC motor 14 to the energizing force and the opposite direction of a return spring, as shown in drawing 2, OFF control of the transistors 26 and 28 is carried out, PWM control of the transistors 22 and 24 is carried out, and it energizes driving current in the figure Nakaya seal direction.
[0023]
In carrying out the forward direction drive of the motor 14 in the energizing force and the direction of a return spring, as shown in drawing 4, OFF control of the transistors 22 and 24 is carried out to them, PWM control of the transistors 26 and 28 is carried out to them, and it energizes driving current in the figure Nakaya seal direction to them.
[0024]
Thus, when the motor drive circuit 20 controls selectively the four transistors 22, 24, 26, and 28 for switching by which bridge connection was carried out to DC motor 14, DC motor 14 is rotated to an opposite direction and a forward direction, and opening adjustment of the secondary valve 12 shown in drawing 12 can be performed.
[0025]
Although the motor drive circuit 20 carries out PWM control of the transistors 22, 24, 26, and 28 in this way and performs opening adjustment of the secondary valve 12, When driving the motor 14 at a low speed and tuning the opening of the secondary valve 12 finely, it is as having mentioned above to perform what is called bang-bang control that lengthens the cycle of PWM.
[0026]
At the time of the OFF timing of said bang-bang control, said springback prevention circuit 30 is formed so that the driving current for maintenance for resisting the energizing force of a return spring and making the stop position carry out stop holding of the secondary valve 12 may be energized to DC motor 14. While the spring back phenomenon that the secondary valve 12 is pulled back with a return spring is prevented certainly and carries out the stepping drive of DC motor 14 by this at a low speed at the time of the OFF timing of bang-bang control, The secondary valve 12 can be certainly moved to a target opening position.
[0027]
The current-limiting resistor 32 which multiple connection of the springback prevention circuit 30 of

working example is carried out to the transistor 22 for reverse drives, and carries out the ** style of the energization current to said driving current for maintenance, Multiple connection is carried out to other transistors 24 for reverse drives, and the transistor 34 which forms the energization circuit for a bypass at the time of the OFF timing of bang-bang control is included. Said resistance 32 is good also as elements and circuitry other than this, if the ** style of the energization current can be carried out to said driving current for maintenance.

[0028]

Therefore, at the time of the OFF timing of the bang-bang control of the drive circuit 20, as shown in drawing 3, to DC motor 14, the current for an opposite direction drive will energize by one [the transistor 34]. This driving current is controlled by the resistance 32 so that the rotational output of DC motor 14 serves as a value of the grade which offsets the energizing force of a return spring at this time. Therefore, the spring back phenomenon that the secondary valve 12 is pulled back by the energizing force of a return spring will be certainly prevented at the time of the OFF timing of bang-bang control.

[0029]

When carrying out bang-bang control of the motor drive circuit 20, it is shown in drawing 5 whether what we do with the on-off control of said each transistors 22-28, and 34.

[0030]

It is shown to drawing 6 and drawing 7 by the timing chart at the time of driving the control circuit of working example according to the procedure shown in drawing 5, and drawing 6, The timing chart in the case of driving DC motor 14 to motor energizing force and a counter direction (opposite direction) and the timing chart in case drawing 7 drives DC motor 14 in the energizing force and the direction (forward direction) of a down spring are shown, respectively.

[0031]

As shown in the figure, when carrying out bang-bang control of the motor drive circuit 20, according to the OFF timing, switch control of the transistor 34 for a bypass of the springback prevention circuit 30 is carried out, and the holding power which offsets the energizing force of a return spring to DC motor 14 is given. Thereby, the secondary valve 12 can be turned to a target opening position, and movement controls can be carried out certainly.

[0032]

The actual opening position which the target opening position of the secondary valve 12 is expressed with a dashed line, and is controlled using the circuit of working example is expressed with the solid line to drawing 14. With the device of working example which carries out bang-bang control of the motor drive circuit 20, it will be understood that the secondary valve 12 is certainly controllable in accordance with a target opening position, offsetting the energizing force of a return spring, as shown in the figure.

[0033]

By the way, as composition of the springback prevention circuit 30 mentioned above, the position of the resistance 32 and the transistor 34 may be made reverse, and the composition in this case is shown in drawing 8.

[0034]

As shown in drawing 9, the Orr (OR) gate 36 is connected to the base of the transistor 24 for reverse drives, It may form so that the control signal as the DC motor drive circuit 20 may be inputted into one input terminal of this OR gate 36 and the control signal as the springback prevention circuit 30 may be selectively inputted into the terminal of another side of OR gate 36. Thereby, some transistors 24 of the motor drive circuit 20 can be made to serve a double purpose also as a part of circuit of the springback prevention circuit 30, and the cost cut of the whole circuit can be aimed at.

[0035]

The springback prevention circuit 30 mentioned above can also be post-installed in the drive circuit 20 of DC motor 14. In [drawing 10 shows the composition in this case, and] the figure, The transistors 22-28 arranged in the shape of a bridge are formed as IC chip 120, and DC motor 14 and the springback prevention circuit 30 are connected with the circuit shown in drawing 1 equivalent to the terminal area of this IC chip 120.

[0036]

The 2nd suitable working example of this invention is described below the 2nd working example.
[0037]
As a power supply to DC motor 14 mentioned above, the battery attached to the engine is used in many cases. In using this battery source, when the power consumption in other electric equipment articles increases, power supply voltage falls and there is a possibility that the station keeping of the secondary valve 12 at the time of the OFF timing of bang bang control may become unstable.
[0038]
That is, if the current for driving DC motor 14 to the energizing direction and opposite direction of a return spring falls by the voltage variation of a battery source, The running torque of DC motor 14 does not result in a predetermined value, but there is a possibility that it may be pulled back as a result by the position from which the secondary valve 12 separated from the position according to the energizing force of the return spring.
[0039]
It is shown to drawing 11 by suitable working example of this invention which solved such SUBJECT, and the feature of this example, The voltage of the battery source 100 is detected and it is in having controlled so that the current which flows into DC motor 14 at the time of the OFF timing of bang-bang control always served as a fixed value based on this detection result.
[0040]
In working example, the motor drive circuit 20 is formed as IC chip 120 like the example shown in drawing 10. Since the details are the same as that of the circuitry shown in drawing 10, the explanation is omitted here.
[0041]
The springback prevention circuit 30 of working example, FET114 of ****** by which multiple connection was carried out to the transistor 110 for a bypass by which multiple connection was carried out to the transistor 22 for reverse drives, the transistor 112 for this bypass-transistors 110 drive, and other transistors 24 for reverse drives is included.
[0042]
The resistance 102,104 for partial pressures which carries out the partial pressure output of the voltage of the battery source 100, the control circuit 108 where this partial pressure output is inputted, and the regulated power supply 106 for said control circuit 108 are included in the circuit of working example.
[0043]
Including the microcomputer by which a constant voltage drive is carried out, the output of said partial pressure circuit was inputted by the regulated power supply 24 via the A/D converter in the I/O-interface face which is not illustrated, and said control circuit 108 has detected the voltage variation of the battery source 100 by it. This control circuit 108 is constituted so that IC chip [which constitutes the motor drive circuit 20] 120, transistor 112, and FET114 may be controlled via the D/A converter in the I/O interface which is not illustrated.
[0044]
That is, in carrying out PWM control of the motor drive circuit 20, and carrying out drive controlling of DC motor 14 and carrying out low speed driving of DC motor 14, as the drive circuit 24 was described above, it is carrying out bang-bang control of the control circuit 108.
[0045]
In carrying out bang-bang control of the motor 14, According to the OFF timing of bang-bang control, the one drive of the transistor 110 for a bypass is carried out via the transistor 112, and PWM control of FET114 is carried out so that the predetermined driving current for maintenance may flow into DC motor 14 according to the voltage variation of the battery source 100 further.
[0046]
That is, in the control circuit 108, the relation between the partial pressure voltage inputted via the partial pressure resistance 102,104 and the duty ratio for PWM control which balances with a return spring at the time of this partial pressure voltage output is beforehand memorized as a look-up table.
The control circuit 108 carries out PWM control of FET114 by the duty ratio corresponding to the partial pressure voltage inputted.

[0047]
Thereby, at the time of the OFF timing of bang-bang control, DC motor 14 is unchanging with change of power supply voltage, generates the rotational output which balances with the energizing force of a return spring, and can prevent the spring back phenomenon of the secondary valve 12 more certainly.
[0048]
Various kinds of modification implementation is possible for this design within the limits of the gist of this design, without being limited to said each working example.
[0049]

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a circuit diagram for explaining the important section of the throttle centrifugal-spark-advancer control device of the engine by this design.
[Drawing 2]It is an explanatory view of the circuit shown in drawing 1 of operation.
[Drawing 3]They are other explanatory views of the circuit shown in drawing 1 of operation.
[Drawing 4]It is another explanatory view of the circuit shown in drawing 1 of operation.
[Drawing 5]It is a front figure for explaining operation of each member used for the circuit shown in drawing 1.
[Drawing 6]It is a timing chart for explaining the characteristic of the circuit shown in drawing 1.
[Drawing 7]It is a timing chart for explaining other characteristics of the circuit shown in drawing 1.
[Drawing 8]It is a circuit diagram of the modification of the circuit shown in drawing 1.
[Drawing 9]It is a circuit diagram of another modification of the circuit shown in drawing 1.
[Drawing 10]It is a circuit diagram of another modification of the circuit shown in drawing 1.
[Drawing 11]It is a circuit diagram showing the 2nd working example of the throttle centrifugal-spark-advancer control device of the engine by this design.
[Drawing 12]It is a mimetic diagram showing the outline composition of an engine throttle governor device.
[Drawing 13]It is a control circuit figure of the motor used for the control device shown in drawing 12.
[Drawing 14]It is a diagram for explaining the characteristic of the control circuit shown in drawing 1.
[Drawing 15]It is a diagram for explaining the problem of the control circuit shown in drawing 13.
[Description of Notations]
10 Throttle valve
12 Secondary valve
14 DC motor
20 Motor drive circuit
22 Transistor
24 Transistor
26 Transistor
28 Transistor
30 Springback prevention circuit
32 Resistance
34 Bypass transistors
36 OR gate 36
100 Battery source
102 Partial pressure resistance
104 Partial pressure resistance
106 Regulated power supply
108 Control circuit
110 Transistor
112 Transistor
114 FET

120 IC chip

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DETAILED DESCRIPTION

[Detailed explanation of the device]
[0001]
[Industrial Application]
This design is related with the opening control structure of the secondary valve for centrifugal spark advancers in more detail about an engine throttle centrifugal-spark-advancer control device.
[0002]
[Description of the Prior Art]
When setting up the inspired air volume according to the amount of treading in of the accelerator pedal, the structure of preventing superfluous rotation of an engine with a possibility of producing with the inspired air volume is adopted as the suction system which supplies gaseous mixture to the so-called combustion chamber of an engine.
[0003]
As a throttle centrifugal spark advancer used for such a suction system, The throttle valve to which an inhalation-of-air opening is set according to the amount of treading in of an accelerator pedal, The thing provided with the secondary valve which extracts the inspired air volume which is installed side by side with this throttle valve, and is obtained by the throttle valve, and controls superfluous rotation of an engine is known, Such a throttle centrifugal spark advancer is widely used, for example as the industrial truck for cargo work, a lawn mower, and a throttle centrifugal spark advancer for engines of other various kinds.
[0004]
Such a throttle centrifugal spark advancer's general composition is shown in drawing 12. For this throttle centrifugal spark advancer, the throttle valve 10 and the secondary valve 12 are installed in the engine intake path side by side.
As for said throttle valve 10, the opening is set up according to the amount of treading in of an accelerator pedal.

[0005]
Said secondary valve 12 is rotated using DC motor 14, and the opening to an intake path is set up. For example, when inspired air volume increases according to the opening of the throttle valve 10, and the secondary valve 12 rotates to the side which closes an intake path, inspired air volume is extracted and the throttle centrifugal spark advancer which prevents superfluous rotation of an engine when inspired air volume increases is constituted.
[0006]
And this secondary valve 12 is set up considering the position closed contrary to the position or this which usually opens an intake path with the return spring which is not illustrated as an initial position.
The opening adjustment is performed by rotation of DC motor 14.

[0007]
An example of the conventional motor drive circuit used for the drive of said DC motor 14 is shown in drawing 13.
[0008]

When the energizing direction of a return spring is defined as a forward direction, in here this conventional motor drive open circuit 20, Bridge connection of the two transistors 26 and 28 for switching for a forward direction drive and the two transistors 22 and 24 for switching for an opposite direction drive is carried out to DC motor 14. Such a bridged circuit is usually called H bridge.

[0009]

And the one end side of this bridged circuit is connected to the battery power source Vcc, and the other end side is connected to the ground side.

By carrying out switching control of the transistor combined with the forward direction or the opposite direction selectively, DC motor 14 is rotated to a forward direction and an opposite direction.

Usually, by this PWM control, although speed control of said DC motor 14 was performed by carrying out PWM control of the transistor, when low speed driving of the motor 14 was carried out, sufficient motor starting current could not be energized but there was a problem that a motor could not be rotated.

[0010]

Namely, when the low speed rotary of the motor tends to be carried out using PWM control, it is necessary to make duty ratio of driver voltage small and to shorten the applying time substantially, and, When done in this way, in order to start a motor, sufficient current could not be energized, but a motor did not rotate, or instability or a hysteresis phenomenon was caused, and a good low speed rotary was not able to be realized.

[0011]

So, when driving DC motor 14 at a low speed, as shown in drawing 15, what is called bang-bang control of being stabilized and making DC motor 14 drive certainly is performed by setting up the cycle of PWM for a long time, and lengthening applying time of the driver voltage per time. This bang-bang control (BANG-BANG control) energizes sufficient driving current from setting up the cycle of PWM thru/or the applying time of driver voltage for a long time, as shown in drawing 15, and it can drive a motor certainly. However, since time not to impress this one side and voltage also becomes long, the motor 14 will stop in the meantime. that is, according to the timing of turning on and off of motor driving voltage, DC motor 14 repeats rotation and a stop -- a stepping drive will be carried out.

[0012]

[Problem(s) to be Solved by the Device]

However, since the energizing force by a return spring is always acting on the secondary valve 12 as described above, If the stepping drive of DC motor 14 is carried out, the springback that the secondary valve 12 is pulled back by the energizing force of a return spring at the time of motor-off will arise. Thus, in the conventional motor drive circuit, if bang-bang control of DC motor 14 is carried out, The hunting phenomena that the opening of the secondary valve 12 is pulled back for every OFF timing of driver voltage occur, Opening setting out of the secondary valve 12 became very unstable, low speed driving of DC motor 14 was carried out substantially, and there was a problem that the opening of the secondary valve 12 could not be tuned finely.

[0013]

Although lengthening the pulse cycle in Pulse Density Modulation, performing the detecting position of the secondary valve 12, and performing feedback control of the opening of the secondary valve 12 for the purpose of canceling such fault is also considered, According to such a method, special composition, such as potentionmeter for detecting the opening position of a valve and an encoder, will be needed, and the control mechanism itself will become intricately and expensive.

[0014]

This design is made in view of such conventional SUBJECT, and the purpose, Even when carrying out bang-bang control of the DC motor, it is in providing the engine throttle centrifugal-spark-advancer control device which can perform opening setting out of a secondary valve correctly without being influenced by the energizing force of a return spring.

[0015]

[Means for Solving the Problem]

A throttle valve to which an inhalation-of-air opening is set according to this design and the amount of treading in of an accelerator pedal in order to attain said purpose, A secondary valve which is installed side

by side with said throttle valve, extracts inspired air volume obtained with an opening of the above-mentioned throttle valve, and controls superfluous rotation of an engine, In a throttle-valve centrifugal spark advancer containing a DC motor which carries out opening adjustment of said secondary valve from an initial position energized with a return spring, To said DC motor, at least two switching elements for a forward direction drive to said Litang SUPURIGU energizing direction, Bridge connection of at least two switching elements for an opposite direction drive is carried out, A motor drive circuit which carries out bang-bang control of said switching element, and turns said secondary valve to a target opening position at the time of low speed driving of said DC motor and to which it is made to move, At the time of OFF timing of said bang-bang control, it is characterized by including a springback prevention circuit which energizes driving current for maintenance for resisting energizing force of said return spring and making the present opening position stop a secondary valve to said DC motor.

[0016]

[Function]

When carrying out bang-bang control of the motor drive circuit according to this design, The driving current for maintenance for resisting the energizing force of a return spring and making the present opening position stop a secondary valve is energized to a DC motor using a springback prevention circuit at the time of the OFF timing of bang-bang control.

[0017]

Thereby, at the time of the OFF operation of bang-bang control, a DC motor is driven so that the energizing force of a return spring may be offset, and it can prevent certainly the spring back phenomenon that a secondary valve is pulled back by the energizing force of a return spring.

[0018]

Therefore, according to this design, even when bang-bang control of the DC motor is carried out, a secondary valve is turned to a target opening position, and it can control certainly, without generating hunting phenomena like before.

[0019]

[Example]

Next, suitable working example of this design is described in detail based on Drawings.

[0020]

The major circuit composition of the throttle centrifugal-spark-advancer control device of this design is shown in 1st working example drawing 1. Identical codes are given to drawing 12 and the conventional device of drawing 13 which were mentioned above, and a corresponding member, and the explanation is omitted to them.

[0021]

The throttle centrifugal-spark-advancer control device of working example includes the motor drive circuit 20 which drives DC motor 14, and the springback prevention circuit 30 which prevents the spring back phenomenon at the time of the bang-bang control of the motor drive circuit 20.

[0022]

Said motor drive circuit 20 is constituted like the conventional circuit shown in drawing 13. For example, in rotating DC motor 14 to the energizing force and the opposite direction of a return spring, as shown in drawing 2, OFF control of the transistors 26 and 28 is carried out, PWM control of the transistors 22 and 24 is carried out, and it energizes driving current in the figure Nakaya seal direction.

[0023]

In carrying out the forward direction drive of the motor 14 in the energizing force and the direction of a return spring, as shown in drawing 4, OFF control of the transistors 22 and 24 is carried out to them, PWM control of the transistors 26 and 28 is carried out to them, and it energizes driving current in the figure Nakaya seal direction to them.

[0024]

Thus, when the motor drive circuit 20 controls selectively the four transistors 22, 24, 26, and 28 for switching by which bridge connection was carried out to DC motor 14, DC motor 14 is rotated to an opposite direction and a forward direction, and opening adjustment of the secondary valve 12 shown in drawing 12 can be performed.

[0025]
Although the motor drive circuit 20 carries out PWM control of the transistors 22, 24, 26, and 28 in this way and performs opening adjustment of the secondary valve 12, When driving the motor 14 at a low speed and tuning the opening of the secondary valve 12 finely, it is as having mentioned above to perform what is called bang-bang control that lengthens the cycle of PWM.
[0026]
At the time of the OFF timing of said bang-bang control, said springback prevention circuit 30 is formed so that the driving current for maintenance for resisting the energizing force of a return spring and making the stop position carry out stop holding of the secondary valve 12 may be energized to DC motor 14. While the spring back phenomenon that the secondary valve 12 is pulled back with a return spring is prevented certainly and carries out the stepping drive of DC motor 14 by this at a low speed at the time of the OFF timing of bang-bang control, The secondary valve 12 can be certainly moved to a target opening position.
[0027]
The current-limiting resistor 32 which multiple connection of the springback prevention circuit 30 of working example is carried out to the transistor 22 for reverse drives, and carries out the ** style of the energization current to said driving current for maintenance, Multiple connection is carried out to other transistors 24 for reverse drives, and the transistor 34 which forms the energization circuit for a bypass at the time of the OFF timing of bang-bang control is included. Said resistance 32 is good also as elements and circuitry other than this, if the ** style of the energization current can be carried out to said driving current for maintenance.
[0028]
Therefore, at the time of the OFF timing of the bang-bang control of the drive circuit 20, as shown in drawing 3, to DC motor 14, the current for an opposite direction drive will energize by one [the transistor 34]. This driving current is controlled by the resistance 32 so that the rotational output of DC motor 14 serves as a value of the grade which offsets the energizing force of a return spring at this time. Therefore, the spring back phenomenon that the secondary valve 12 is pulled back by the energizing force of a return spring will be certainly prevented at the time of the OFF timing of bang-bang control.
[0029]
When carrying out bang-bang control of the motor drive circuit 20, it is shown in drawing 5 whether what we do with the on-off control of said each transistors 22-28, and 34.
[0030]
It is shown to drawing 6 and drawing 7 by the timing chart at the time of driving the control circuit of working example according to the procedure shown in drawing 5, and drawing 6, The timing chart in the case of driving DC motor 14 to motor energizing force and a counter direction (opposite direction) and the timing chart in case drawing 7 drives DC motor 14 in the energizing force and the direction (forward direction) of a down spring are shown, respectively.
[0031]
As shown in the figure, when carrying out bang-bang control of the motor drive circuit 20, according to the OFF timing, switch control of the transistor 34 for a bypass of the springback prevention circuit 30 is carried out, and the holding power which offsets the energizing force of a return spring to DC motor 14 is given. Thereby, the secondary valve 12 can be turned to a target opening position, and movement controls can be carried out certainly.
[0032]
The actual opening position which the target opening position of the secondary valve 12 is expressed with a dashed line, and is controlled using the circuit of working example is expressed with the solid line to drawing 14. With the device of working example which carries out bang-bang control of the motor drive circuit 20, it will be understood that the secondary valve 12 is certainly controllable in accordance with a target opening position, offsetting the energizing force of a return spring, as shown in the figure.
[0033]
By the way, as composition of the springback prevention circuit 30 mentioned above, the position of the resistance 32 and the transistor 34 may be made reverse, and the composition in this case is shown in drawing 8.

[0034]
As shown in drawing 9, the Orr (OR) gate 36 is connected to the base of the transistor 24 for reverse drives, It may form so that the control signal as the DC motor drive circuit 20 may be inputted into one input terminal of this OR gate 36 and the control signal as the springback prevention circuit 30 may be selectively inputted into the terminal of another side of OR gate 36. Thereby, some transistors 24 of the motor drive circuit 20 can be made to serve a double purpose also as a part of circuit of the springback prevention circuit 30, and the cost cut of the whole circuit can be aimed at.
[0035]
The springback prevention circuit 30 mentioned above can also be post-installed in the drive circuit 20 of DC motor 14. In [drawing 10 shows the composition in this case, and] the figure, The transistors 22-28 arranged in the shape of a bridge are formed as IC chip 120, and DC motor 14 and the springback prevention circuit 30 are connected with the circuit shown in drawing 1 equivalent to the terminal area of this IC chip 120.
[0036]
The 2nd suitable working example of this invention is described below the 2nd working example.
[0037]
As a power supply to DC motor 14 mentioned above, the battery attached to the engine is used in many cases. In using this battery source, when the power consumption in other electric equipment articles increases, power supply voltage falls and there is a possibility that the station keeping of the secondary valve 12 at the time of the OFF timing of bang bang control may become unstable.
[0038]
That is, if the current for driving DC motor 14 to the energizing direction and opposite direction of a return spring falls by the voltage variation of a battery source, The running torque of DC motor 14 does not result in a predetermined value, but there is a possibility that it may be pulled back as a result by the position from which the secondary valve 12 separated from the position according to the energizing force of the return spring.
[0039]
It is shown to drawing 11 by suitable working example of this invention which solved such SUBJECT, and the feature of this example, The voltage of the battery source 100 is detected and it is in having controlled so that the current which flows into DC motor 14 at the time of the OFF timing of bang-bang control always served as a fixed value based on this detection result.
[0040]
In working example, the motor drive circuit 20 is formed as IC chip 120 like the example shown in drawing 10. Since the details are the same as that of the circuitry shown in drawing 10, the explanation is omitted here.
[0041]
The springback prevention circuit 30 of working example, FET114 of ****** by which multiple connection was carried out to the transistor 110 for a bypass by which multiple connection was carried out to the transistor 22 for reverse drives, the transistor 112 for this bypass-transistors 110 drive, and other transistors 24 for reverse drives is included.
[0042]
The resistance 102,104 for partial pressures which carries out the partial pressure output of the voltage of the battery source 100, the control circuit 108 where this partial pressure output is inputted, and the regulated power supply 106 for said control circuit 108 are included in the circuit of working example.
[0043]
Including the microcomputer by which a constant voltage drive is carried out, the output of said partial pressure circuit was inputted by the regulated power supply 24 via the A/D converter in the I/O-interface face which is not illustrated, and said control circuit 108 has detected the voltage variation of the battery source 100 by it. This control circuit 108 is constituted so that IC chip [which constitutes the motor drive circuit 20] 120, transistor 112, and FET114 may be controlled via the D/A converter in the I/O interface which is not illustrated.
[0044]

That is, in carrying out PWM control of the motor drive circuit 20, and carrying out drive controlling of DC motor 14 and carrying out low speed driving of DC motor 14, as the drive circuit 24 was described above, it is carrying out bang-bang control of the control circuit 108.

[0045]

In carrying out bang-bang control of the motor 14, According to the OFF timing of bang-bang control, the one drive of the transistor 110 for a bypass is carried out via the transistor 112, and PWM control of FET114 is carried out so that the predetermined driving current for maintenance may flow into DC motor 14 according to the voltage variation of the battery source 100 further.

[0046]

That is, in the control circuit 108, the relation between the partial pressure voltage inputted via the partial pressure resistance 102,104 and the duty ratio for PWM control which balances with a return spring at the time of this partial pressure voltage output is beforehand memorized as a look-up table.

The control circuit 108 carries out PWM control of FET114 by the duty ratio corresponding to the partial pressure voltage inputted.

[0047]

Thereby, at the time of the OFF timing of bang-bang control, DC motor 14 is unchanging with change of power supply voltage, generates the rotational output which balances with the energizing force of a return spring, and can prevent the spring back phenomenon of the secondary valve 12 more certainly.

[0048]

Various kinds of modification implementation is possible for this design within the limits of the gist of this design, without being limited to said each working example.

[0049]

[Effect of the Device]

As explained above, according to this design, bang-bang control of the motor drive circuit is carried out, When controlling a secondary valve in a prescribed opening position, carrying out low speed driving of the DC motor, By energizing the driving current for maintenance for resisting the energizing force of a return spring and making the present opening position stop a secondary valve at the time of the OFF timing of bang-bang control to a DC motor, The springback of a secondary valve is prevented certainly, it can move to a prescribed opening position correctly, and a secondary valve can be positioned.

[0050]

In particular, according to this design, it is effective in the ability to perform simply and cheaply opening adjustment of the secondary valve using bang-bang control, without using a complicated control circuit.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claims]
[Claim 1]A throttle valve to which an inhalation-of-air opening is set according to the amount of treading in of an accelerator pedal, A secondary valve which is installed side by side with said throttle valve, extracts inspired air volume obtained with an opening of the above-mentioned throttle valve, and controls superfluous rotation of an engine, In a throttle-valve centrifugal spark advancer containing a DC motor which carries out opening adjustment of said secondary valve from an initial position energized with a return spring, To said DC motor, at least two switching elements for a forward direction drive to said Litang SUPURIGU energizing direction, Bridge connection of at least two switching elements for an opposite direction drive is carried out, A motor drive circuit which carries out bang-bang control of said switching element, and turns said secondary valve to a target opening position at the time of low speed driving of said DC motor and to which it is made to move, A springback prevention circuit which energizes driving current for maintenance for resisting energizing force of said return spring and making the present opening position stop a secondary valve at the time of OFF timing of said bang-bang control to said DC motor, ****** -- a throttle centrifugal-spark-advancer control device of an engine characterized by things.
[Claim 2]In Claim 1, said springback prevention circuit, The current-limiting circuit unit which multiple connection is carried out to either of the switching elements for said reverse drives, and carries out the ** style of the energization current to said driving current for maintenance, A throttle centrifugal-spark-advancer control device of an engine by which the bypass circuit unit which forms an energization circuit for a bypass at the time of OFF timing of said bang-bang control being included to said other switching elements for reverse drives.
[Claim 3]A throttle centrifugal-spark-advancer control device of an engine, wherein said current-limiting circuit unit is formed in Claim 2 as a resistance element by which multiple connection was carried out to either of the switching elements for said reverse drives.
[Claim 4]In Claim 2, current variation accompanying change of power supply voltage including a current compensation circuit to compensate said current-limiting circuit unit, It is formed as a switching element for a bypass by which multiple connection was carried out to either of the switching elements for said reverse drives, and said current compensation circuit, Detect change of power supply voltage, and it is formed so that fixed driving current for maintenance may flow and PWM control of said switching element for a bypass may be carried out at the time of OFF timing of said bang-bang control, A throttle centrifugal-spark-advancer control device of an engine resisting influence of said return spring and making the present opening position stop a secondary valve at the time of OFF timing of bang-bang control without being influenced by change of power supply voltage.

[Translation done.]

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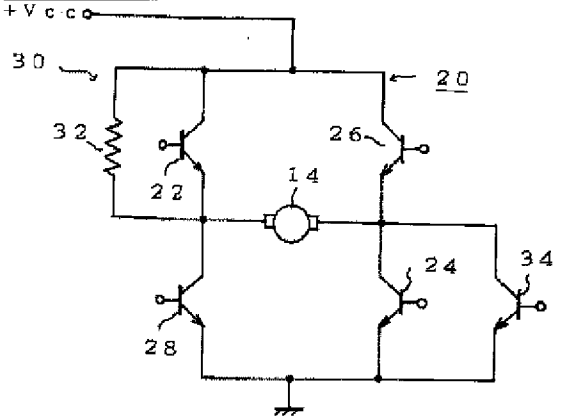
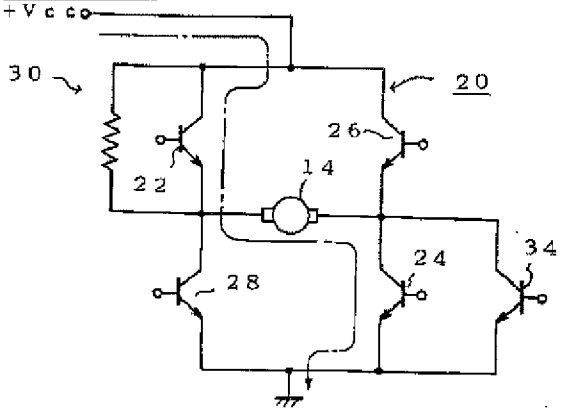
DRAWINGS

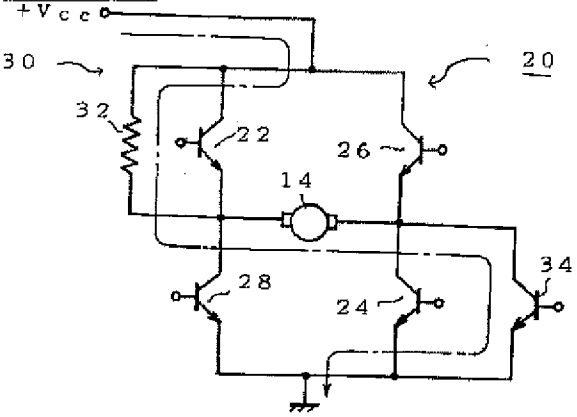
[Drawing 1]



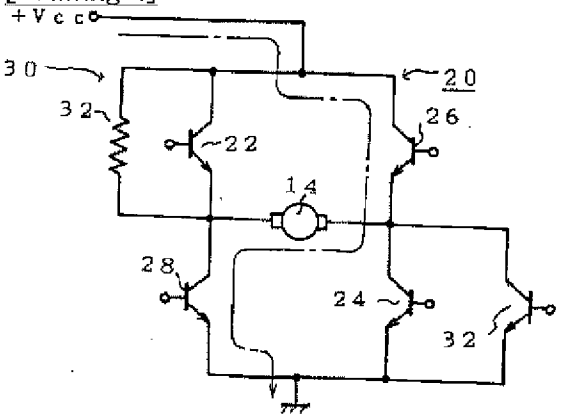
[Drawing 2]



[Drawing 3]



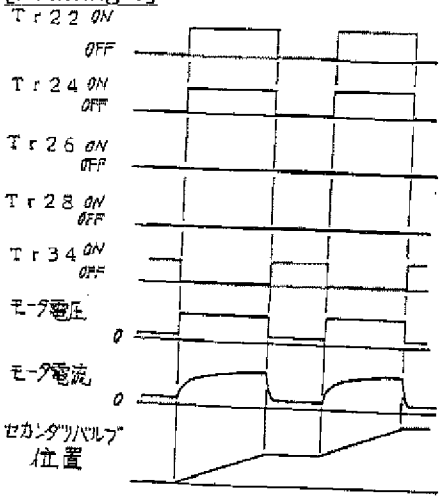
[Drawing 4]



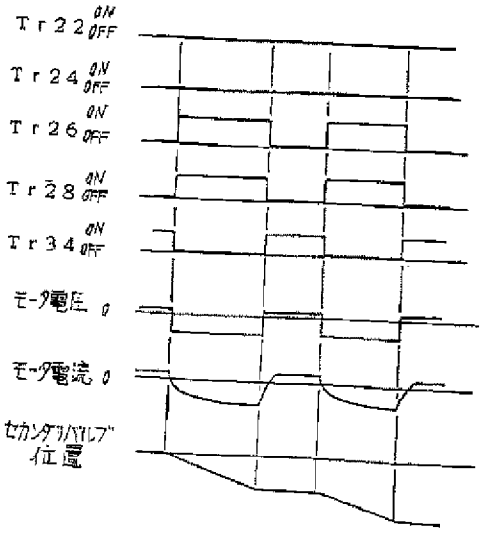
[Drawing 5]

	スプリング付勢方向と逆方向に回転するとき		スプリング付勢方向と同方向に回転するとき		バルブを停止させる時	制御しない時
	PWM信号 ON	PWM信号 OFF	PWM信号 ON	PWM信号 OFF		
Tr22	ON	OFF	OFF	OFF	OFF	OFF
Tr24	ON	OFF	OFF	OFF	OFF	OFF
Tr26	OFF	OFF	ON	OFF	OFF	OFF
Tr28	OFF	OFF	ON	OFF	OFF	OFF
Tr34	OFF	ON	OFF	ON	ON	OFF

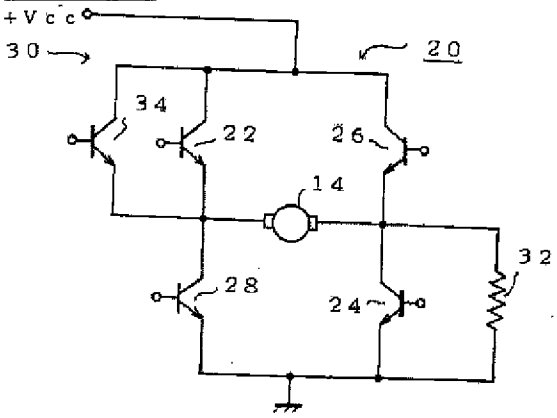
[Drawing 6]



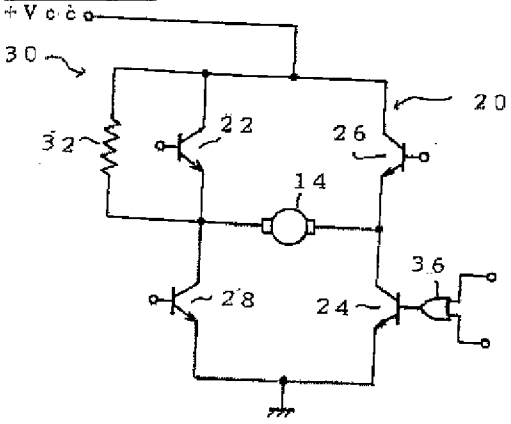
[Drawing 7]



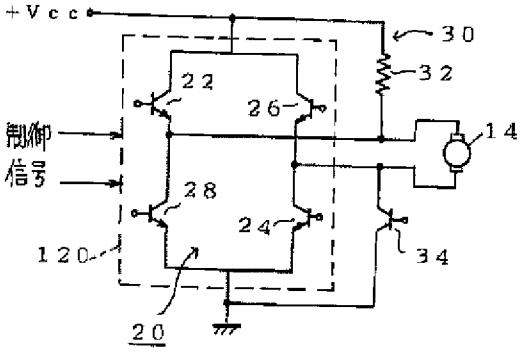
[Drawing 8]



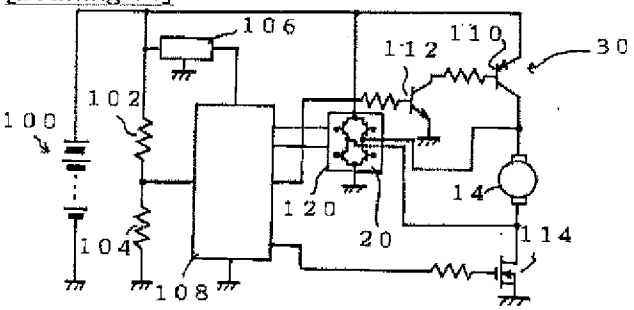
[Drawing 9]



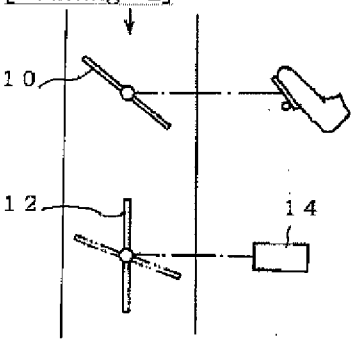
[Drawing 10]



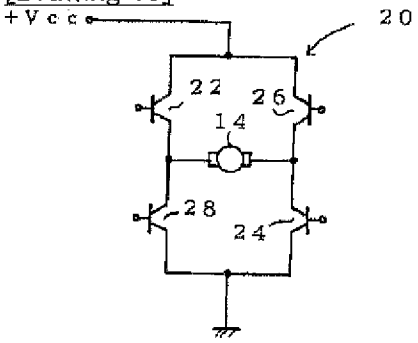
[Drawing 11]



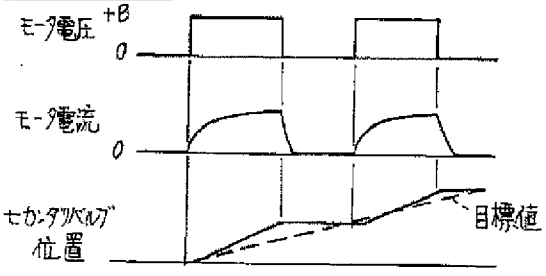
[Drawing 12]



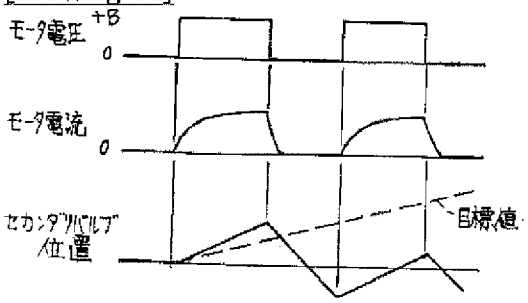
[Drawing 13]



[Drawing 14]



[Drawing 15]



[Translation done.]